BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PATENT SPECIFICATION

(11) 1 247 616

DRAWINGS ATTACHED

(21) Application No. 38532/69 (22) Filed 31 July 1969

(23) Complete Specification filed 16 July 1970

(45) Complete Specification published 29 Sept. 1971

(51) International Classification B 32 b 3/30 5/20 27/30

(52) Index at acceptance

B2E 178 186 187 189 18Y 190 209 20Y 24Y 268 299 308 339 420 435 43Y 44Y 473 475 485 486 487 489 48Y 498 499 515 517 519 52Y 533 536 54Y 555 55Y 588 768 798

1 247 616

ERRATA

SPECIFICATION NO 1247616

Page 1, line 27, *for* 0.0095 *read* 0.005

Page 2, line 45, *for* felter *read* felted

THE PATENT OFFICE
18 October 1973

R 72012/11

ment:—

A development in recent years has been the production of flexible sheet material consisting of a backing and a surface layer of a foamed or cellular resinous composition presenting a relief surface. These materials are useful *inter alia* as floor coverings and upholstery.

It is known to print a multi-coloured design of a foamable thermoplastic resinous composition onto a textured and flexible backing, with subsequent heating to fuse the composition and form a three-dimensional foamed structure. The backing may be naturally textured, for example a coarse woven fabric, or it may be initially smooth and suitably embossed to provide a textured surface. The depressions thus formed or naturally existing may be about 0.0095 inch deep. They are a permanent feature of the backing. The resinous composition, which includes a blowing agent by which the cellular structure is formed on heating, is applied as a layer with a smooth top surface. On blowing, the layer expands, and its final top surface reflects the original patterns in the backing.

It is also known to coat a backing with a foamable composition and then to emboss the composition with a conventional heated embossing roll to obtain the desired relief pattern. This method does not rely on any form of deformation of the backing.

Our object in this invention is to produce a coating preferably but not necessarily cellular, with a relief pattern on a backing without permanently deforming the

[*Price 25p*]

applied layer being [illegible]

formed backing is allowed to recover so that the exposed surface of the applied layer develops a relief pattern, and the applied layer is set to form a solid coating. This coating then presents a relief pattern corresponding to the elastic deformation of the backing.

Preferably the resinous composition is applied to the backing by roller coating, the backing being passed between an embossed back-up roll and a smooth application roll, and the resinous composition being supplied to the application roll. The composition generates a hydraulic pressure between the rolls, deforming the backing in accordance with the embossed pattern on the back-up roll, and is itself deposited at the same time on the backing as a layer filling the deformations and with a flat and even surface. When the backing emerges from the rolls, its surface recovers, and the desired effect of a locally varying thickness of the applied composition is seen.

The setting of the applied layer to a solid state may be effected in any convenient way in accordance with the composition of the layer, for example by heat or evaporation of a solvent contained in it. Advantageously, the resinous composition contains a blowing agent so that the final coating with the relief surface is expanded by decomposition of the blowing agent on heating, and thus the relief pattern is accentuated.

The resinous composition may be a conventional foamable vinyl plastisol. The layer in this case may be set or rendered

SEE ERRATA SLIP ATTACHED

PATENT SPECIFICATION

(11) 1 247 616

DRAWINGS ATTACHED

(21) Application No. 38532/69 (22) Filed 31 July 1969

(23) Complete Specification filed 16 July 1970

(45) Complete Specification published 29 Sept. 1971

(51) International Classification B 32 b 3/30 5/20 27/30

(52) Index at acceptance

B2E 178 186 187 189 18Y 190 209 20Y 24Y 268 299 308 339 420 435 43Y 44Y 473 475 485 486 487 489 48Y 498 499 515 517 519 52Y 533 536 54Y 555 55Y 588 630 65Y 699 708 709 725 727 729 739 73Y 768 798 799 806

1 247 616

(72) Inventor DUNCAN BRYCE BLACK

(54) COATED SUBSTRATES

(71) We, NAIRN-WILLIAMSON LIMITED, a British Company, of Lune Mills Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

A development in recent years has been the production of flexible sheet material consisting of a backing and a surface layer of a foamed or cellular resinous composition presenting a relief surface. These materials are useful *inter alia* as floor coverings and upholstery.

It is known to print a multi-coloured design of a foamable thermoplastic resinous composition onto a textured and flexible backing, with subsequent heating to fuse the composition and form a three-dimensional foamed structure. The backing may be naturally textured, for example a coarse woven fabric, or it may be initially smooth and suitably embossed to provide a textured surface. The depressions thus formed or naturally existing may be about 0.0095 inch deep. They are a permanent feature of the backing. The resinous composition, which includes a blowing agent by which the cellular structure is formed on heating, is applied as a layer with a smooth top surface. On blowing, the layer expands, and its final top surface reflects the original patterns in the backing.

It is also known to coat a backing with a foamable composition and then to emboss the composition with a conventional heated embossing roll to obtain the desired relief pattern. This method does not rely on any form of deformation of the backing.

Our object in this invention is to produce a coating preferably but not necessarily cellular, with a relief pattern on a backing without permanently deforming the backing and without having to emboss the layer that forms the coating.

According to the invention the surface of a substantially smooth resilient backing is elastically deformed, a layer of a resinous composition is applied to the elastically deformed surface, the exposed surface of the applied layer being flat, the elastically deformed backing is allowed to recover so that the exposed surface of the applied layer develops a relief pattern, and the applied layer is set to form a solid coating. This coating then presents a relief pattern corresponding to the elastic deformation of the backing.

Preferably the resinous composition is applied to the backing by roller coating, the backing being passed between an embossed back-up roll and a smooth application roll, and the resinous composition being supplied to the application roll. The composition generates a hydraulic pressure between the rolls, deforming the backing in accordance with the embossed pattern on the back-up roll, and is itself deposited at the same time on the backing as a layer filling the deformations and with a flat and even surface. When the backing emerges from the rolls, its surface recovers, and the desired effect of a locally varying thickness of the applied composition is seen.

The setting of the applied layer to a solid state may be effected in any convenient way in accordance with the composition of the layer, for example by heat or evaporation of a solvent contained in it. Advantageously, the resinous composition contains a blowing agent so that the final coating with the relief surface is expanded by decomposition of the blowing agent on heating, and thus the relief pattern is accentuated.

The resinous composition may be a conventional foamable vinyl plastisol. The layer in this case may be set or rendered

solid by heating to a temperature below the decomposition temperature of the blowing agent, and then may be subjected to a temperature above the decomposition temperature of the blowing agent in the course of further processing to produce the cellular structure.

In any case the resinous composition should be of appropriate viscosity, since it should not flow so easily that the relief pattern is lost before the composition can be set.

An example of a foamable resinous composition in parts by weight is as follows:—

Polyvinylchloride (paste grade)	100
Plasticiser	40-60
Pigment	0-5
Stabiliser	2
Blowing agent	1-2
Diluent	0-5

The polyvinylchloride preferably has a viscosity number (see BS2782-Part 4-1958-method 404A) within the range of 95 to 135: part of it may be replaced by a filler-grade resin of similar viscosity number. The plasticiser may be phthalate or phosphate ester or a blend of these: secondary plasticisers such as epoxidised vegetable oils or chlorinated hydrocarbons may replace part of the primary plasticisers. The pigments may be chosen from those suitable for use in vinyl compounding: inorganic pigments, such as oxides and chromes are particularly suitable. The stabiliser may be of the barium-cadmium-zinc type or may be dibasic lead phosphate. A suitable blowing agent is azodicarbonamide. The diluent may be a hydrocarbon solvent with a boiling range from 150-200°C: its use may or may not be necessary, depending on the remainder of the composition, in order to impart a suitable viscosity to the composition.

Suitable materials for the backing include felter sheets formed from cellulosic or mineral fibres, which may be bound or impregnated with resinous materials such as butadiene-styrene copolymers, polyvinylacetate and neoprene. Woven and needled fabrics are also suitable and may be formed from fibres such as cotton, jute and asbestos. If the weave or texture of the substrate is open, a sizing coating may be applied by conventional methods to reduce penetration of the coating of the resinous composition.

It is desirable to be able to print a decorative pattern over the whole area of the surface, for example by rotogravure printing methods. If the whole area is to be printed by direct rotogravure printing, a suitable depth of relief (the difference between the top of a projection and the bottom of a depression) is within the range of 0.002 to 0.003 inches. This range may vary depending on the nature and thickness of the backing and the coating composition, and may also be extended by the use of offset printing.

A transparent wear layer may be superimposed in conventional manner to protect the pattern. An example of a clear vinyl wear-layer composition in parts by weight is:

Polyvinylchloride (paste grade)	100
Plasticiser	40-50
Stabiliser	3
Diluent	0-5

The polyvinylchloride in this composition preferably has a viscosity number within the range of 135 to 180. The plasticiser, stabiliser and diluent may be any of those suitable for use in the coating composition.

If the printing is effected on a coating containing a blowing agent before the composition is blown, a multi-coloured patterned surface with clearly visible relief will be obtained.

An example will now be given with reference to the accompanying diagrammatic drawings (not to scale), in which Figure 1 shows a conventional reverse-roll coater together with an engraved back-up roll.

Figure 2 shows the pattern of engraving on the back-up roll;

Figure 3 is an enlarged section along the nip between the back-up roll and the contacting roll of the coater;

Figure 4 is a section through the coated backing after it has left the nip between the back-up roll and the contacting roll of the coater; and

Figure 5 is a section through a finished foamed product.

In Figure 1 a reverse roll coater is shown with smooth rolls 1 and 2, and an engraved rubber back-up roll 3. As shown by Figure 2, axial and circumferential grooves ar cut in the rubber to a depth of 1/16th inch and with a width of 1/4 inch, leaving upstanding shaded areas, only some of which are shown. A backing of asbestos felt 4 is supplied to the nip between the rolls 2 and 3, and a foamable vinyl plastisol 5 is fed to the nip between rolls 1 and 2. The rolls 1 and 2 revolve at different speeds as in conventional reverse-roll coating practice with the gap set to give a film thickness of 0.012 inch of plastisol on the asbestos felt. The engraved roll 3 drives the asbestos felt forward and presses it against the roll 2; this roll 3 is mounted so that it will yield somewhat under applied pressure.

Referring now to Figure 3, the vinyl plastisol exercises a separating pressure on the rolls 2 and 3, tending to float them apart, and this pressure is transmitted to the asbestos felt, pressing it into the

grooves in the roll 3. Thus the layer of vinyl plastisol fills up the depressions in the asbestos felt.

On leaving the nip between the rolls 2 and 3, the asbestos felt at once recovers its shape, with the result seen in Figure 4. Here the relief on the surface of the applied layer of composition is apparent. The felt and the composition layer are then passed through a hot box where the plastisol is set at a temperature below the decomposition temperature of the blowing agent.

The product is then printed with a suitable pattern by rotogravure printing and passed through a further reverse-roll coater with a plain back-up roll, where a thickness of 0.007 inch of clear vinyl plastisol is applied to the product. The product is passed into another hot box, at a temperature sufficiently high to decompose the blowing agent and cure the material. A section through the product is shown in Figure 5, the printing being indicated at 6 and the transparent wear layer at 7.

WHAT WE CLAIM IS:—

1. A process for the production of flexible sheet material consisting of a backing and a coating presenting a relief surface in which the surface of a substantially smooth resilient backing is elastically deformed, a layer of a resinous composition is applied to the elastically deformed surface, the exposed surface of the applied layer being flat, the elastically deformed backing is allowed to recover so that the exposed surface of the applied layer develops a relief pattern, and the applied layer is set to form a solid coating.

2. A process according to claim 1 in which the resinous composition is applied to the backing by roller coating, the backing being passed between an embossed back-up roll and a smooth application roll, and the resinous composition being supplied to the application roll.

3. A process according to claim 1 or claim 2 in which the resinous composition contains a blowing agent and the applied layer is heated to decompose the blowing agent after the relief pattern has been formed.

4. A process according to any preceding claim in which the coating is printed with a decorative pattern.

5. A process according to claims 3 and 4 in which the printing is effected before the heating to decompose the blowing agent.

6. A process according to claim 4 or claim 5 in which a transparent wear layer is superimposed on the printed pattern.

7. A process according to any preceding claim in which the resinous composition is a foamable vinyl plastisol.

8. A process according to claim 1 substantially as described with reference to the example and the accompanying drawing.

9. A flexible sheet material made by a process according to any preceding claim.

For the Applicants:
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
51/52, Chancery Lane,
London. W.C.2.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1971.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1,247,616
1 SHEET

COMPLETE SPECIFICATION

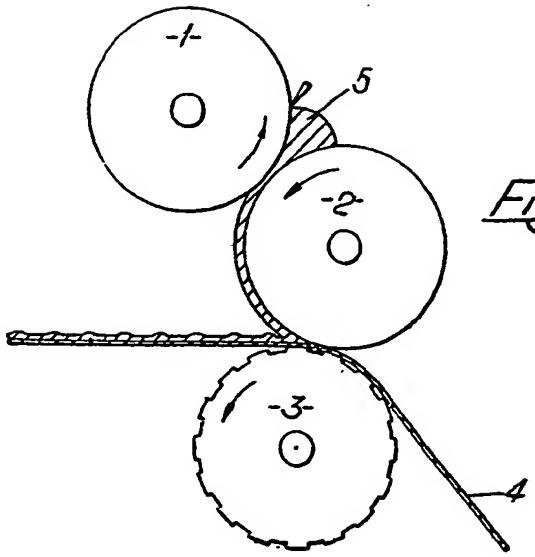

Fig. 1.

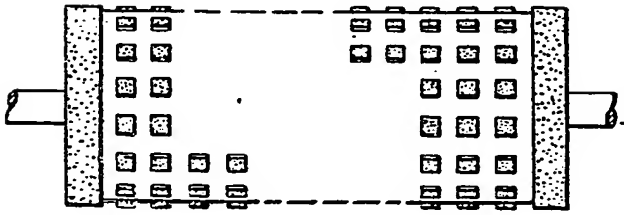

Fig. 2.

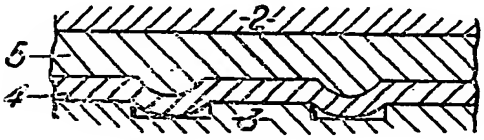

Fig. 3.

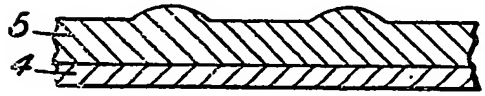

Fig. 4.

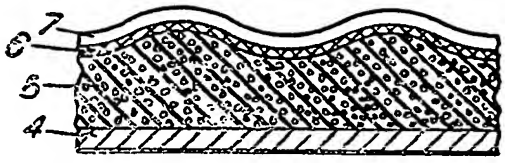

Fig. 5.